

IN THE CLAIMS:

Claims 8 and 18 are amended. No new matter is believed to be introduced by such amendments. Moreover, the amendment to claim 18 herein is simply to correct a typographical error and has no effect with respect to the substance of claim 18.

1. **(Previously presented)** An x-ray device, comprising:
 - (a) a vacuum enclosure;
 - (b) an integral cathode disposed in said vacuum enclosure, said integral cathode including an emitter capable of discharging electrons, said emitter having a predetermined geometrical configuration oriented to cause at least some of the discharged electrons to converge at a focal spot;
 - (c) a power source connected to said emitter so that transmission of power from said power source to said emitter causes said emitter to discharge electrons; and
 - (d) a target anode disposed in said vacuum enclosure and having a target surface positioned to receive at least some of the electrons discharged by said emitter.

2. **(Original)** The x-ray device as recited in Claim 1, wherein said focal spot is located proximate to said target surface of said target anode.

3. **(Original)** The x-ray device as recited in Claim 1, further comprising a support cartridge, said support cartridge receiving said emitter and maintaining said emitter in a desired configuration.

4. **(Original)** The x-ray device as recited in Claim 3, wherein said support cartridge facilitates substantial electrical isolation of said integral cathode.

5. **(Previously presented)** In an x-ray tube comprising a vacuum enclosure having disposed therein a target anode with a target surface, an integral cathode disposed in the vacuum enclosure and being spaced apart from the target surface of the target anode, the integral cathode comprising:

- (a) an emitter capable of discharging electrons, said emitter having a predetermined geometrical configuration oriented to cause at least some of the discharged electrons to be directed at the target surface of the target anode and converge at a focal spot; and
- (b) a support cartridge, said support cartridge providing structural support for said emitter.

6. **(Original)** The integral cathode as recited in Claim 5, wherein said focal spot is proximate to the target surface of the target anode.

7. **(Previously presented)** The integral cathode as recited in claim 5, wherein at least a portion of said emitter is received in said support cartridge in a manner so as to retain said emitter in the predetermined geometrical configuration.

8. **(Currently amended)** The integral cathode as recited in claim 5, In an x-ray tube comprising a vacuum enclosure having disposed therein a target anode with a target surface, an integral cathode disposed in the vacuum enclosure and being spaced apart from the target surface of the target anode, the integral cathode comprising:

- (a) an emitter capable of discharging electrons, said emitter having a predetermined geometrical configuration oriented to cause at least some of the discharged electrons to be directed at the target surface of the target anode and converge at a focal spot, wherein said predetermined geometrical configuration provides an emitter having a cross-section substantially in the shape of an arc so that a concave side of said emitter is directed towards the target surface of the anode; and
- (b) a support cartridge, said support cartridge providing structural support for said emitter.

9. **(Original)** The integral cathode as recited in Claim 5, wherein said emitter is substantially composed of a refractory metal.

10. **(Original)** The integral cathode as recited in Claim 5, wherein said emitter is composed of a combination of tungsten and rhenium.

11. **(Original)** The integral cathode as recited in Claim 5, wherein said support cartridge comprises at least one electrically conductive portion, said electron beam and said focal spot being selectively manipulated by application of a voltage to said at least one electrically conductive portion.

12. **(Original)** The integral cathode as recited in Claim 5, wherein said emitter comprises a plurality of subsidiary emitting portions.

13. **(Original)** The integral cathode as recited in Claim 12, wherein said plurality of subsidiary emitting portions are integral with each other.

14. **(Original)** The integral cathode as recited in Claim 5, wherein said emitter comprises at least two subsidiary emitting portions not parallel to each other, said at least two subsidiary emitting portions cooperating to facilitate said convergence of said at least some discharged electrons at said focal spot.

15. **(Original)** The integral cathode as recited in Claim 14, wherein said at least two subsidiary emitting portions are integral with each other.

16. **(Original)** The integral cathode as recited in Claim 14, wherein said at least two subsidiary emitting portions are disposed in a substantially "V" shaped configuration.

17. **(Original)** The integral cathode as recited in Claim 5, wherein said emitter is substantially bowl shaped.

18. **(Currently amended)** The integral cathode as recited in Claim 5, wherein a plurality of cut out portions are defined in said emitter, said plurality of cutout portions collectively defining [a] an electrical current path.

19. **(Original)** The integral cathode as recited in Claim 5, wherein said support cartridge facilitates substantial electrical isolation of the integral cathode.

20. **(Original)** The integral cathode as recited in Claim 19, wherein said support cartridge is substantially composed of iron, said iron being cataphoretically coated so that at least a portion of said support cartridge is rendered electrically non-conductive.

21. **(Original)** The integral cathode as recited in Claim 19, wherein said support cartridge is electrically non-conductive.

22. **(Original)** The integral cathode as recited in Claim 21, wherein said support cartridge is substantially composed of ceramic.

23. through 27. **(Withdrawn)**

28. **(Previously presented)** In an x-ray tube comprising a vacuum enclosure having disposed therein a target anode with a target surface, a cathode disposed in the vacuum enclosure and being spaced apart from the target surface of the target anode, the cathode comprising:

- (a) an emitter capable of discharging electrons, said emitter having two or more non-parallel emitting surfaces oriented so as to cause at least some of the discharged electrons to be directed at a focal spot on the target surface of the target anode; and
- (b) a support cartridge, said support cartridge providing structural support for said emitter.

29. **(Previously presented)** In an x-ray tube comprising a vacuum enclosure having disposed therein a target anode with a target surface, a cathode disposed in the vacuum enclosure and being spaced apart from the target surface of the target anode, the cathode comprising:

- (a) an emitter having at least one emission surface capable of discharging electrons towards a focal spot on the target surface of the target anode; and

- (b) a support cartridge, said support cartridge retaining said emitter in a manner such that the at least one emission surface assumes a predetermined geometric shape.

30. **(Previously presented)** An x-ray device, comprising:

- (a) a vacuum enclosure;
- (b) an integral cathode disposed in said vacuum enclosure and including an emitter that serves as the primary electron source for the x-ray device, said emitter substantially comprising an emissive material and a geometry of said emitter being such as to cause at least some electrons discharged by said emitter to converge at a focal spot;
- (c) a power source configured for communication with said integral cathode; and
- (d) a target anode disposed in said vacuum enclosure and having a target surface positioned to receive at least some electrons discharged by said emitter.

31. **(Previously presented)** The x-ray device as recited in claim 30, wherein said emitter substantially comprises a single piece of emissive material.

32. **(Previously presented)** The x-ray device as recited in claim 30, wherein said emitter comprises a plurality of subsidiary emitting portions.

33. **(Previously presented)** The x-ray device as recited in claim 32, wherein at least one of said subsidiary emitting portions is substantially planar.

34. **(Previously presented)** The x-ray device as recited in claim 32, wherein at least one of said subsidiary emitting portions substantially comprises a geometry selected from the group consisting of: parabolic sections; and spherical sections.

35. **(Previously presented)** The x-ray device as recited in claim 30, wherein said emitter defines at least one cutout portion.

36. **(Previously presented)** The x-ray device as recited in claim 30, wherein said geometry of said emitter substantially comprises a parabolic section.

37. **(Previously presented)** The x-ray device as recited in claim 30, wherein said geometry of said emitter substantially comprises a spherical section.

38. **(Previously presented)** The x-ray device as recited in claim 30, wherein said geometry of said emitter substantially comprises an angular bend.

39. **(Previously presented)** The x-ray device as recited in claim 30, wherein said emissive material of said emitter substantially comprises a refractory metal.

40. **(Previously presented)** The x-ray device as recited in claim 30, wherein said emissive material of said emitter substantially comprises a combination of tungsten and rhenium.

41. **(Previously presented)** The x-ray device as recited in claim 30, further comprising a support cartridge wherein at least a portion of the emitter is positioned.

42. **(Previously presented)** The x-ray device as recited in claim 41, wherein said support cartridge facilitates definition of said geometry of said emitter.

43. **(Previously presented)** The x-ray device as recited in claim 41, wherein said support cartridge substantially comprises an electrically non-conductive material.

44. **(Previously presented)** In an x-ray device having a vacuum enclosure wherein is substantially disposed a target anode that includes a target surface, an integral cathode substantially disposed in said vacuum enclosure in a spaced apart configuration with respect to said target surface of said target anode, the integral cathode comprising:

- (a) an emitter that serves as the primary electron source for the x-ray device, said emitter substantially comprising an emissive material and a geometry of said emitter being such as to cause at least some electrons discharged by said emitter to converge at a focal spot; and
- (b) a support cartridge wherein at least a portion of the emitter is positioned.

45. **(Previously presented)** The integral cathode as recited in claim 44, wherein said emitter substantially comprises a single piece of emissive material.

46. **(Previously presented)** The integral cathode as recited in claim 44, wherein said emitter comprises a plurality of subsidiary emitting portions.

47. **(Previously presented)** The integral cathode as recited in claim 46, wherein at least one of said subsidiary emitting portions is substantially planar.

48. **(Previously presented)** The integral cathode as recited in claim 46, wherein at least one of said subsidiary emitting portions defines a geometry selected from the group consisting of: parabolic sections; and spherical sections.

49. **(Previously presented)** The integral cathode as recited in claim 44, wherein said emitter defines at least one cutout portion.

50. **(Previously presented)** The integral cathode as recited in claim 44, wherein said geometry of said emitter substantially comprises a geometry selected from the group consisting of: parabolic sections; and spherical sections.

51. **(Previously presented)** The integral cathode as recited in claim 44, wherein said emitter substantially comprises a refractory metal.

52. **(Previously presented)** The integral cathode as recited in claim 44, wherein said support cartridge facilitates definition of said geometry of said emitter.

53. **(Previously presented)** In an x-ray device having a vacuum enclosure wherein is substantially disposed a target anode that includes a target surface, an integral cathode substantially disposed in said vacuum enclosure in a spaced apart configuration with respect to said target surface of said target anode, the integral cathode comprising:

- (a) an emitter that serves as the primary electron source for the x-ray device, said emitter substantially comprising a single piece of emissive material and a geometry of said emitter being such that said emitter includes convex and concave sides, said concave side of said emitter being positioned such that at least some electrons discharged by said emitter converge at a focal spot proximate the target surface of the target anode; and
- (b) a non-electrically conductive support cartridge wherein at least a portion of the emitter is positioned, said support cartridge facilitating definition of said geometry of said emitter.

54. **(Previously presented)** The integral cathode as recited in claim 53, wherein said geometry of said emitter is selected from the group consisting of: parabolic sections; and spherical sections.

55. **(Previously presented)** The integral cathode as recited in claim 53, wherein said emitter defines at least one cutout portion.

56. **(Previously presented)** The integral cathode as recited in claim 53, wherein said emitter substantially comprises a refractory metal.

RESPONSE

This paper is presented in response to the Examiner's Office Action mailed August 13, 2003 (the "Office Action"). Claims 8 and 18 are amended herein, and Claims 1-22 and claims 28-56 remain pending in this application.

Reconsideration of this application is respectfully requested in view of the amendment herein and the following remarks. For the convenience and reference of the Examiner, the remarks of the Applicant are presented in the order in which the corresponding issues were raised in the Office Action.

In connection with the matters contemplated herein, Applicant respectfully notes at the outset that the following discussion should not be construed to constitute an exhaustive enumeration of the distinctions between the claims of the present application and the references cited by the Examiner. Instead, such distinctions are presented solely by way of example. Consistent with the foregoing, the discussion herein is not intended, and should not be construed, to prejudice or foreclose future consideration, by the Applicant, of additional or alternative distinctions between the claims of the present application and the references cited by the Examiner.

I. Claim Rejections

The Examiner has stated in the Office Action that while the arguments of Applicant previously submitted in Paper No. 15 (Applicant's Response filed June 6, 2003) concerning claims 1, 5, 28, 29, 44 and 53 are considered persuasive, and the previous rejection of those claims accordingly withdrawn, "a new ground(s) of rejection is made in view of arguments presented in Paper No. 15 (noted above) with respect to the interpretation of recited claim

language limitations (i.e. geometrical configuration of included emitter) and previously applied reference: DeCou, Jr. et al. (U.S. Patent 5,264,801).”

Applicant respectfully submits however that the foregoing statement by the Examiner is somewhat vague and nonspecific. The issue is further obscured by the fact that the Examiner has not identified any particular statements by the Applicant that would tend to provide even colorable support for the allegations that the Examiner appears to be making.

As best understood by the Applicant, the aforementioned statement by the Examiner appears to be, at least, an allegation by the Examiner that Applicant has somehow defined or characterized (in Paper No. 15) the claim limitation directed to an “*emitter having a predetermined geometrical configuration oriented to cause at least some of the discharged electrons to converge at a focal spot*” as having some particular meaning and that such alleged definition or characterization, according to the Examiner, accordingly forms a proper basis for the rejections posed by the Examiner in the Office Action. However, as noted above, the Examiner has not cited any statements by Applicant that would tend to provide support for this allegation.

Moreover, Applicant respectfully submits that, in any event, none of the statements made by Applicant in Paper No. 15 constitute any kind of characterization or definition of any of the terms, elements or limitations of the pending claims. Rather, Applicant simply recites, verbatim, portions of selected pending claims. In view of the foregoing, Applicant respectfully submits that the allegation of the Examiner is not well-founded and, accordingly, cannot and does not serve as a proper basis for the rejections posed by the Examiner.

The aforementioned statement by the Examiner, as best understood by Applicant, and considered in connection with the 35 U.S.C. § 102(b) rejection made by the Examiner in the

Office Action, further appears to allege that the Applicant has somehow conceded that U.S. Patent 5,264,801 issued to DeCou, Jr. et al. (*DeCou*) discloses the limitation concerning “*an emitter capable of discharging electrons, said emitter having a predetermined geometrical configuration oriented to cause at least some of the discharged electrons to converge at a focal spot,*” an element which the Examiner has already conceded, is not taught by DeCou (see below). As discussed herein however, Applicant has never made, and does not now make, such a concession, nor has Applicant ever so characterized the teaching of the *DeCou* reference. Rather, Applicant has consistently maintained, and continues to maintain, that *DeCou* fails to teach, at least, the above-recited limitation.

In particular, the allegation of the Examiner in this regard appears to be directed to statements made by Applicant in Paper No. 15 that “Figure 1 of *DeCou* clearly indicates that while electrons emitted from the filament are somewhat dispersed initially, such electrons are subsequently focused into an electron beam 16 that is directed toward a focal spot 18 on a tungsten track 20 of a target. See also, col. 2, lines 61-65,” and, further, that “the *DeCou* device is already configured to focus the electrons.” Nowhere do either of those statements by the Applicant attribute the focusing functionality to any specific element of the *DeCou* device, much less to the filament, as the Examiner has alleged. Consistently, the only function attributed by *DeCou* to the disclosed filament is emission of an electron cloud. In particular, the passage cited by the Examiner as allegedly supporting the rejection indicates only that “A cathode filament 12 disposed within the envelope generates a cloud of electrons” (emphasis added). Col. 2, lines 61-65. Nothing in that passage indicates how, or by what component, the cloud of electrons is focused.

Consistent with the foregoing, the Examiner has failed to cite any passage from *DeCou* that attributes any sort of focusing functionality to the filament, or to any other element of the *DeCou* device for that matter. Moreover, as noted earlier herein, the Examiner has conceded (in the Office Action mailed July 8, 2002) that “DeCou Jr. et al. do [sic] not explicitly disclose an emitter having a predetermined geometrical configuration oriented to cause at least some of the discharged electrons to converge to a focal spot” (emphasis added).

Finally, as noted above, Applicant has consistently maintained that *DeCou* fails to teach the claim 1 limitation “*an emitter capable of discharging electrons, said emitter having a predetermined geometrical configuration oriented to cause at least some of the discharged electrons to be directed at the target surface of the target anode and converge at a focal spot.*” In this regard, the attention of the Examiner is respectfully directed to, for example, the Amendment and Response to First Office Action filed by Applicant on March 18, 2002, where Applicant stated “Contrary to the assertion by the Examiner, *DeCou* fails to teach at least one claim limitation explicitly recited in claims 1, 5, 28 and 29. For example, DeCou does not teach or suggest: . . . a cathode comprised of an ‘emitter having a predetermined geometrical shape configured to cause at least some of the discharged electrons to be directed at the target surface of the target anode and converge at a focal spot’” (emphasis added).

Accordingly, Applicant respectfully submits that in view of the fact that Applicant has consistently maintained, and continues to maintain, that *DeCou* fails to teach, at least, the above-recited limitation, and further in view of the fact that the Examiner has conceded that *DeCou* fails to teach such limitation, all of the rejections posed by the Examiner and based upon the erroneous allegation made by the Examiner concerning Applicant’s statements regarding the

DeCou reference have been overcome and should be withdrawn, as discussed in further detail below.

A. Claim Rejections Under 35 U.S.C. § 102(b)

Applicant respectfully notes that a claim is anticipated under 35 U.S.C. § 102(a), (b), or (e) only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. Further, the identical invention must be shown in as complete detail as is contained in the claim (emphasis added). Finally, the elements must be arranged as required by the claim. See Manual of Patent Examining Procedure (“M.P.E.P.”) § 2131.

With reference to the specific claim rejections, the Examiner has rejected claims 1-3, 5-7, 11-16, 18, 28-39 and 41-56 as being anticipated by *DeCou*. For at least the reasons outlined herein however, such rejections have been overcome and should be withdrawn.

i. Claims 1-3, 5-7, 11-16, and 18

The Examiner has rejected claims 1-3, 5-7, 11-16, and 18 as being anticipated by *DeCou*. As noted above however, Applicant has consistently maintained, and continues to maintain, that *DeCou* fails to teach, at least, the limitation concerning an “emitter [having] a predetermined geometrical configuration oriented to cause at least some of the discharged electrons to converge to a focal spot.” Accordingly, the rejection of independent claims 1 and 5, each of which includes the above-recited limitation that the Examiner has admitted is missing from *DeCou*, is overcome and should be withdrawn. The same is likewise true of claims 2 and 3 (depending from claim 1) and claims 6, 7, 11 through 16, and 18 (depending from claim 5).

ii. Claims 28 and 29

As noted above, the Examiner has rejected claims 28 and 29 as being anticipated by *DeCou*. In an attempt to support that rejection, the Examiner alleges that *DeCou* teaches, among other things, an “emitter [having] a predetermined geometrical configuration oriented to cause at least some of the discharged electrons to converge to a focal spot.” As noted elsewhere herein however, *DeCou* contains no such teaching. Moreover, neither claim 28 nor claim 29 recites such an element in any event. Accordingly, the rejection of claims 28 and 29 based upon *DeCou* has been overcome and should be withdrawn.

iii. Claims 30-39 and 41-43

The Examiner has also rejected claim 30 as being anticipated by *DeCou*. Among other things, claim 30 requires “an emitter . . . [having] a geometry . . . such as to cause at least some electrons discharged by said emitter to converge at a focal spot.” As discussed elsewhere herein however, *DeCou* fails to teach, at least, this limitation. Accordingly, the rejection of claim 30, as well as the rejection of claims 31-39 and 41-43 depending from claim 30, has been overcome and should be withdrawn.

iv. Claims 44-52

Additionally, the Examiner has rejected claim 44 as being anticipated by *DeCou*. As in the case of claim 30, discussed above, claim 44 requires, among other things, “an emitter . . . [having] a geometry . . . such as to cause at least some electrons discharged by said emitter to converge at a focal spot.” As discussed elsewhere herein however, *DeCou* fails to teach, at least, this limitation. Accordingly, the rejection of claim 44, as well as the rejection of claims 45-52 depending from claim 44, has been overcome and should be withdrawn.

v. **Claim 53**

Finally, the Examiner has rejected claim 53 as being anticipated by *DeCou*. In an attempt to support that rejection, the Examiner alleges that *DeCou* teaches, among other things, an “emitter [having] a predetermined geometrical configuration oriented to cause at least some of the discharged electrons to converge to a focal spot.” As noted elsewhere herein however, *DeCou* contains no such teaching. Moreover, claim 53 does not recite such an element in any event. Accordingly, the rejection of claim 53 based upon *DeCou* has been overcome and should be withdrawn.

B. **Claim Rejections Under 35 U.S.C. § 103(a)**

Applicant respectfully notes at the outset that in order to establish a *prima facie* case of obviousness, it is the burden of the Examiner to demonstrate that three criteria are met: first, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; second, there must be a reasonable expectation of success; and third, the prior art reference (or references when combined) must teach or suggest all the claim limitations. See M.P.E.P. § 2143.

i. **Claims 9, 10, 17 and 40**

The Examiner has rejected claims 9, 10, 17 and 40 as being unpatentable over *DeCou*. Applicant notes that claims 9, 10 and 17 depend from claim 5. As noted elsewhere herein however, *DeCou* fails to teach, at least, the limitation of claim 5 concerning an “emitter [having] a predetermined geometrical configuration oriented to cause at least some of the discharged electrons to converge to a focal spot.” Additionally, *DeCou* fails to teach the limitation of claim 30, from

which claim 40 depends, concerning “an emitter . . . [having] a geometry . . . such as to cause at least some electrons discharged by said emitter to converge at a focal spot.”

Because the prior art reference, even when modified as suggested by the Examiner, fails to teach or suggest all the limitation of claims 9, 10, 17 and 40, the Examiner has failed to make out a prima facie case of obviousness with respect to those claims. Applicant thus respectfully submits that the rejection of the Examiner has been overcome and should be withdrawn.

ii. **Claims 4 and 19-22**

The Examiner has rejected claims 4 and 19-22 as being unpatentable over *DeCou* in view of U.S. Patent No. 5,515,413 issued to Knudsen et al. (“*Knudsen*”). Applicant respectfully notes however that claims 4 and 19-22 all depend from claim 1 which, as noted earlier, recites at least one limitation that the Examiner has conceded is not taught by *DeCou*. In particular, claim 1 requires, among other things, the limitation concerning an “emitter [having] a predetermined geometrical configuration oriented to cause at least some of the discharged electrons to converge to a focal spot.” Further, the Examiner has not provided any evidence that such limitation is provided by *Knudsen*.

Because the cited prior art references, even when combined as suggested by the Examiner, fail to teach or suggest all the limitation of claims 4 and 19-22, the Examiner has failed to make out a prima facie case of obviousness with respect to those claims. Applicant thus respectfully submits that the rejection of the Examiner has been overcome and should be withdrawn.

II. Allowable Subject Matter

The Examiner has objected to claim 8 as being dependent upon a rejected base claim, but has indicated that claim 8 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In connection with the foregoing, Applicant respectfully notes that an objection, by definition, concerns only the form of the claim(s) (as distinguished from the substance of the claim) with respect to which the objection has been posed. *See* Manual of Patent Examining Procedure §§ 706.01, 608.01(n) (emphasis added). Thus, simply rewriting a dependent claim in the manner suggested by the Examiner constitutes only a change to the format of the claim and, without more, has no effect with regard to the substance of the rewritten claim.

Because Applicant has made no change to claim 8 other than to rewrite such claim in independent form to include all of the limitations of the base claim and any intervening claims, Applicant respectfully submits that no change has been made herein to the substance of claim 8 and, further, that claim 8, as rewritten herein, is now in condition for allowance.

Finally, Applicant notes that the amendment of claim 8 herein has been made merely to clarify the claimed embodiments with respect to elements of the cited prior art references. Such claim amendment should not be construed as an acquiescence, on the part of the Applicant, as to the purported teachings or prior art status of the cited references. Accordingly, Applicant reserves the right to challenge the purported teaching and prior art status of the cited references at any appropriate time, should it arise.

CONCLUSION

In view of the remarks and amendment submitted herein, Applicant respectfully submits that each of the pending claims 1-22 and 28-56 are in condition for allowance. Therefore, reconsideration of the rejections is requested and allowance of those claims is respectfully solicited. In the event that the Examiner finds any remaining impediment to a prompt allowance of this application that could be clarified in a telephonic interview, the Examiner is respectfully requested to initiate the same with the undersigned attorney.

Dated this 12th day of November, 2003.

Respectfully submitted,



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